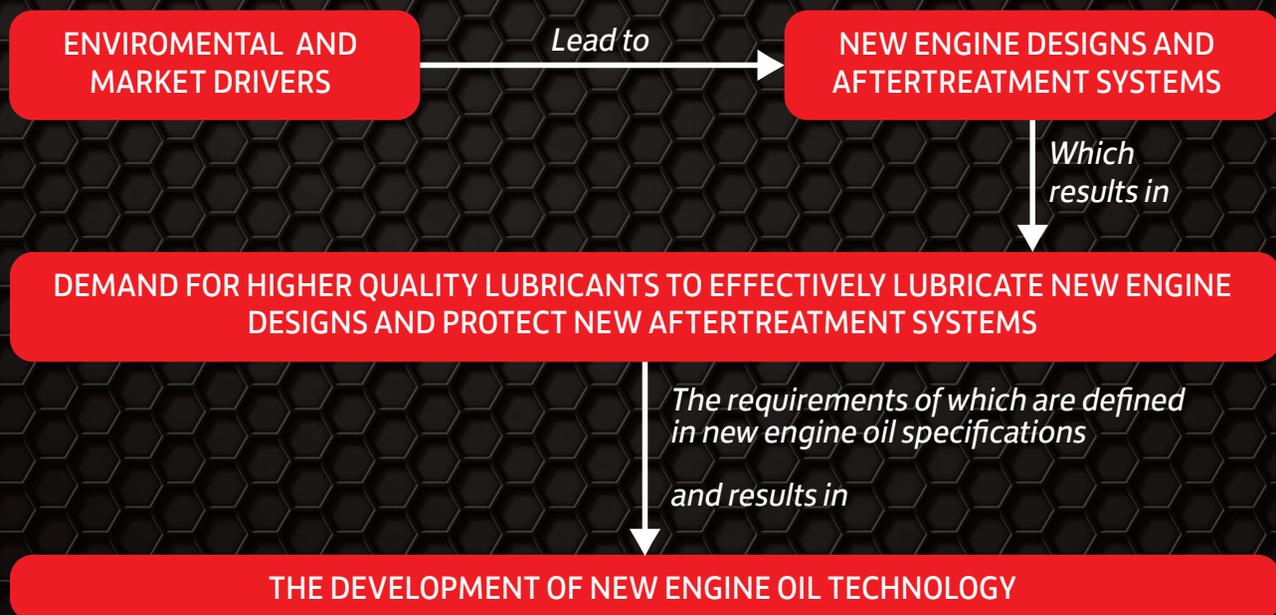


## HOW ENGINE OILS ARE FORMULATED

Engine oil formulations are constantly evolving and are usually required as a result of changing environmental considerations and/or specific OEM requirements. The basic structure can be summarised as



The development of a new engine oil is a gradual process which can take years to complete and can cost several million pounds. The research and development is carried out by additive suppliers in conjunction with the vehicle manufacturer. The OEM's requirements in terms of viscosity, base oil type, chemical limits etc are defined which provide a starting point for the formulation. The process can be a balancing act between competing targets, for example, increasing certain additives to improve engine cleanliness can have a negative impact on fuel economy.

The next step is to carry out laboratory testing and after this full blown engine tests are done. An engine will be taken apart and inspected after each test to determine how well the candidate oil has performed in terms of, for example, wear protection and deposit control, and the oil itself is examined to check that it has retained its properties. If any of the detailed tests result in a failure then the formulation has to be adjusted and the process repeated. Only when all of the tests are passed and all parties are happy does the OEM grant its approval and the additive supplier is then free to supply the technology to lubricant blenders.